The Cost-Effectiveness of Worksite Wellness Programs for Hypertension Control, Weight Loss, Smoking Cessation, and Exercise

Erfurt, John C., Foote, Andrea, Heirich, Max A.. **Personnel Psychology**. Durham: Spring 1992.Vol. 45, Iss. 1; pg. 5, 23 pgs

Subjects:	Wellness programs, Statistical analysis, Preventive medicine, Effectiveness, Cost analysis, Comparative analysis
Classification Codes	9190, 9130, 6500, 3100
Locations:	US
Author(s):	Erfurt, John C., Foote, Andrea, Heirich, Max A.
Publication title:	Personnel Psychology. Durham: Spring 1992. Vol. 45, Iss. 1; pg. 5, 23 pgs
Source type:	Periodical
ISSN/ISBN:	00315826
ProQuest document ID:	8948467
Text Word Count	8582
Document URL:	http://proquest.umi.com/pqdweb?did=8948467&sid=1&Fmt=3&clientId=19649&RQT=309&VName=PQD

Abstract (Document Summary)

The cost-effectiveness of 3 types of worksite wellness programs for reducing the cardiovascular disease risk factors of employees was examined at 3 manufacturing plants in terms of their incremental costs and effectiveness over a comparison site that used a simpler and less expensive program design. The annual direct cost per employee for postscreening interventions was $17.68 for Site A, a comparison site that offered health education classes, $39.28 for Site B, a physical fitness facility, $30.96 for Site C, a site that provided health education plus follow-up counseling, and $38.57 for Site D, which offered health education, follow-up counseling, and plant organization for health promotion. The sites that used systematic outreach and follow-up counseling, sites C and D, were more effective than both Sites A and B and more cost-effective in terms of both engaging employees at risk of cardiovascular disease in treatment or program participation and reducing their risks and-or preventing relapse.

Full Text (8582 words)

The cost-effectiveness of three types of worksite wellness programs for reducing the cardiovascular disease risk factors of employees was examined at three manufacturing plants in terms of their incremental costs and effectiveness over a comparison site that used a simpler and cheaper program design. The risks targeted were hypertension, obesity, cigarette smoking, and lack of regular physical exercise. The annual direct cost per employee for post-screening interventions was $17.68 for Site A (the comparison site that offered health education classes), $39.28 for Site B (physical fitness facility), $30.96 for Site C (health education plus follow-up counseling), and $38.57 for Site D (health education, follow-up counseling, plus plant organization for health promotion). The addition of a physical fitness facility (Site B) did not produce any incremental benefit in reducing risks, as compared with health education classes (Site A), and Site B showed the lowest percentage of employees exercising regularly at the end of the 3-year study period. In contrast, the sites that used systematic outreach and follow-up counseling (Sites C and D) were more effective than both Sites A and B, and more cost-effective in terms of both engaging employees at risk of cardiovascular disease in treatment or program participation, and reducing their risks for preventing relapse.

Many businesses have introduced worksite wellness programs as a way to tackle the problem of constantly escalating health care costs. By intervening early with the potential health problems of employees, employers hope to improve the health and productivity of their workforce, while reducing later demand for more expensive health care services after health has deteriorated. Worksite wellness programs provide services designed to help employees reduce specific health risks such as high blood pressure and cholesterol, cigarette smoking, and

obesity, and to maintain and improve overall health by increasing physical exercise, improving nutrition, and addressing stress.

There is a growing literature examining these worksite wellness programs. Most of this literature examines programs that are focused on a single health risk. The most common risks addressed are high blood pressure (Alderman, Madhavan, & Davis, 1983; Foote & Erfurt, 1983; Logan, Milne, Achber, Campbell, & Haynes, 1979) obesity (Abrams & Follick, 1983; Jeffery, Forster, & Snell, 1985; Stunkard & Brownell, 1980), cigarette smoking (Klesges, Vasey, & Glasgow, 1986; Stachnik & Stoffelmayr, 1983), and inadequate levels of exercise (Cox, Shephard, & Corey, 1981; King, Taylor, Haskell, & DeBusk, 1990). Reviews of the literature also tend to look at program results one risk factor at a time (Fielding, 1982; Leviton, 1987; Warner, Wickizer, Wolfe, Schildroth, & Samuelson, 1988). Most of the literature, thus, tells us nothing about how to design effective comprehensive wellness programs.

A few comprehensive program designs have been tested and show evidence of impact across a variety of health risks, either as compared with baseline risk levels or a compared with a control group (Blair, Piserchia, Wilbur, & Crowder, 1986; Breslow, Fielding, Herrman, & Wilbur, 1990; Erfurt & Holtyn, 1991; Spilman, Goetz, Schultz, Bellingham, & Johnson, 1986). Several studies suggest that a effective worksite wellness program can reduce subsequent employee benefit claims, and some show a cost benefit (Bertera, 1990; Bly, Jones, & Richardson, 1986; Bowne, Russell, Morgan, Optenberg, & Clarke, 1984; Foote & Erfurt, 1991; Gibbs, Mulvaney, Henes, & Reed, 1985). Some studies of interventions for specific health risks have evaluated the program's cost-effectiveness in terms of the dollar cost for each unit of risk reduction (Brownell, Cohen, Stunkard, Felix, & Cooley, 1984; Erfurt & Foote, 1984). Pelletier (1991) recently reviewed the available studies of comprehensive worksite wellness programs and concluded that there is growing evidence that these programs are cost-effective.

However, many different worksite wellness program designs are being implemented, and the positive effects produced by one design would not necessarily occur if a different design were substituted. More systematic evidence that compares effects and costs across different program models is needed. Few such studies now exist.

The data reported here come from such a comparative study. This article will detail the costs of implementing four different models or designs for worksite wellness programs in four automobile manufacturing plants in southeastern Michigan, and will compare these models for cost-effectiveness. Before discussing the specific hypotheses and methods involved in the present analysis, however, we first will describe the overall study design and present briefly the results of the study that have been published elsewhere.

OVERVIEW OF STUDY DESIGN AND RESULTS

This study was designed to test and compare various models of worksite wellness programs. The study had two general hypotheses: first, that wellness programs that include regular, persistent outreach and follow-up counseling with employees would produce greater risk reduction than programs without this outreach and counseling, and second, that programs which develop social support systems at the worksite for healthful activities would be more effective at reducing relapse than programs without these supports.

Four manufacturing plants similar in size and in the demographic characteristics of their employees were randomly allocated to one of four experimental wellness program models. Each plant established a wellness committee made up of representatives from labor, management, and the medical department, to oversee implementation of the program. In addition, a provider of health education classes located near each plant was identified. In each case, the provider was a health promotion unit within a local hospital, and the classes offered at the four worksites were identical (for smoking cessation) or commensurate (for other risks).

In the fall of 1985, health risk screening was conducted in a identical manner at all four study sites over a three to four week period at each plant. Screening was conducted on employees' own time--before and after work, at lunchtime, and on breaks. The screening interview included three different blood pressure measurements, height and weight, and questions about health history, smoking, exercise frequency, and interest in health promotion programs. At the end of the 15-minute screening interview each employee was counseled about his/her risk factors and what he/she should do about them.

Information on employee demographics and screening participation is shown in Table 1. (Table 1 omitted) Participation in initial screening ranged from 75-88% of active employees. The populations screened were predominantly male (83-89%) and white (67-76%), with an average age of 39-43 years. At each plant, these figures

reflected the workforce as a whole. Thus, screening reached the preponderance of employees, and there is no evidence of bias in participation.

Some 93-95% of the employees screened had one or more of the four risk factors of cardiovascular disease: high blood pressure or diagnosed hypertension, obesity, cigarette smoker or ex-smoker, or lacking regular physical exercise (Erfurt, Foote, & Heirich, 1989). These were the risk factors targeted for reduction and relapse prevention.

After initial screening was completed, a 3-year study period began during which each plant implemented a different wellness program design, as follows:

1. Site A (health education): This site tested a common model for health promotion, in which media-focused health education strategies were used to encourage health improvement and participation in health education classes. The model tested the hypothesis that periodically raising people's awareness of health issues will stimulate those with health risks to utilize risk-reduction services, which are made easily available. Health education classes were offered at least twice a year at the plant throughout the study period, and blood pressure monitoring was available in the plant medical department. A health educator working part-time at this site prepared articles about health that appeared monthly in the plant newsletter, and lunchtime lectures on health issues were offered. Additional promotional events included a health fair held at the beginning of the second study year, offering testing for blood pressure, blood cholesterol, lung function, and colorectal cancer; program sign-up tables that were moved throughout the plant; promotion of programs through work teams; a Great American Smokeout and a Great American Low-Fat Pig-Gut. Emphasis at this site was on promotional events and participation in health education classes. This is the most common kind of worksite wellness program (Fielding & Piserchia, 1989; Hollander & Lengerman, 1988;). This plant is identified as Site 2 in previous study reports.

2. Site B (fitness facility): This site (identified as Site 1 in previous reports) took a very different approach to wellness, setting up a physical fitness facility for the use of employees, with extensive aerobic and muscle-building exercise equipment. The facility was staffed by certified athletic trainers available whenever the plant was operating. It was well publicized and all employees were invited to use it on their own time. Moreover, it was made mandatory for employees who had developed a disability, upon their return to work. This is also a popular model for worksite wellness programming. Health education classes for weight loss and smoking cessation were offered shortly after screening was completed but received little participation. No further classes were offered during the study period. Blood pressure monitoring was provided through the plant medical department. This site tested the effects of the presence of a fitness facility on employees' health risk factors.

Both Sites A and B used the traditional medical approach to wellness, in which people identified as having health problems or risks are advised to take action to reduce their risks (e.g., are advised to quit smoking), and resources are made available that they can use (classes, printed materials, fitness centers), but there is no further outreach to individuals, nor any on-going support to assist them in making changes. Sites C and D, on the contrary, both provided systematic outreach and follow-up counseling throughout the study period.

3. Site C (health education and follow-up): The underlying assumption of this model is that behavior change requires not only awareness, but also support, encouragement, and assistance with problem-solving, and a menu of different kinds of intervention strategies (classes, mini-groups, one-to-one counseling, and guided self-help). As at Site A, health education classes were offered at least twice a year, sign-up tables were lit up in the plant every few months to encourage class participation, and articles about health issues appeared regularly in the plant newspaper. In addition, this program included wellness counselors who contacted the employees with identified health risks (high blood pressure, obesity, cigarette smoking) every 6 months, and counseled them regarding risk reduction strategies. They offered assistance to those who said they wanted to make changes on their own ("guided self-help"), and they worked with the external wellness program provider to schedule classes and mini-groups (provided when there were not enough people signed up to make a full class). The employees were encouraged to get regular exercise, but neither physical fitness facilities nor equipment were available within this plant. Emphasis at this site was on one-to-one outreach by wellness counselors to at-risk employees to encourage risk-reduction activities.

4. Site D (health education, follow-up and plant organization): In addition to utilizing all of the strategies employed at Sites A and C, the program at this site used plant-wide organizational strategies to encourage and support employees in making health improvements. The underlying rationale for this model recognizes that many behaviors associated with health risks are pleasant and functional in the short run for reducing stress or managing social situations. Thus, the model emphasizes learning positive substitutes for behaviors that create long-term health risks. Two wellness counselors handled the one-to-one outreach and follow-up counseling, using these

opportunities to develop buddy systems for mutual support in making health behavior changes. The counselors also worked with the wellness committee to organize various kinds of competitions and health-focused events. A mile-long walking course was marked out within the plant, and a lunch-time walking contest introduced the walking route to employees. This site had a small amount of exercise equipment which the counselors helped people learn how to use safely--two rowing machines, two exercise bicycles, and a basketball hoop. The counselors were present in the plant about two-thirds of the time the plant was operating. Emphasis at this site was on promotion of health for all employees, utilizing both promotional events and one-to-one outreach.

In summary, the four models differed as follows:

Site A: health education only,

Site B: physical fitness facility,

Site C: health education and follow-up counseling,

Site D: health education, follow-up counseling, and plant organization.

At the end of a 3-year intervention period, random samples of the initially screened employees were drawn and rescreened. The sample size and response rates are shown in Table 1, along with demographic characteristics of the rescreened employees. Participation in rescreening ranged from 80-84% across the four sites. It was necessary to sample the initially screened population in order to insure that people in the sample had had access to the program for the entire 3 years, and in order to measure health risk changes within each cohort.

Sites A, C, and D all experienced some layoffs during the study period, but these were temporary at Sites A and C and did not involve many employees. Both stayed near their original site throughout the study period. Site D experienced a massive layoff during the last 6 months of the study and some layoffs previous to that, so that the average number of employees over the entire study period was only 1,661, similar to that at Site A. This layoff is evidenced in Table 1, which shows that the average age of those rescreened at Site D was not 3 years greater than at the original screening (as would be expected), but 7 years greater because those with the least seniority were laid off first. This site had started with more young employees than the other three sites, and the layoffs served to make the average age of the rescreened group commensurate with the other sites.

Site B, unlike the other sites, grew during the study period from 3,260 to about 4,500. This did not alter the demographic profile of the study group, since virtually all of those initially screened were available for sampling at rescreening.

A number of reports have already been published out of this study. Two of these provide detailed information about the interventions tested at Sites C and D. A discussion of the underlying theories and procedures involved in one-to-one outreach and follow-up counseling (conducted at both of these sites) has been published, including an examination of data comparing results for employees who received greater and lesser amounts of follow-up counseling (Gregg, Foote, Erfurt, & Heirich, 1990). In another publication, a description of some of the plant organization activities undertaken at Site D is provided, which examines specifically how communications can be made to work effectively within a large worksite (Heirich, Cameron, Erfurt, Foote, & Gregg, 1989).

A description of the fitness component of plant organization activities conducted at Site D is available (Heirich, Konopka, Erfurt, & Foote, 1989), as is a comparison of the impact of different fitness program designs on exercise and other risks (Heirich, Foote, Erfurt, & Konopka, 1991). Participation rates in on-site physical fitness programs were significantly higher at Sites B ad D (where fitness facilities and programs were a central part of the design) than at Sites A and C, with Site D having the highest overall rate. However, frequency of exercise decreased over the study period at Site B. Despite the nearly 3-year existence of its fitness center, Site B had the lowest percentage of employees exercising three or more times a week at the end of the study period.

Another article compares rates of participation in risk-reduction programs across the four models tested (Erfurt, Foote, Heirich, & Gregg, 1990). Participation rates in treatment for high blood pressure (for the hypertensives) were significantly higher at the sites with follow-up (Sites C and D) than at the other two sites, and participation rates in worksite smoking-cessation programs and worksite weight loss programs were five to ten times greater at Sites C and D than at Sites A and B.

Effects of the four models on control of high blood pressure, weight loss, and smoking cessation have been reported (Erfurt, Foote, & Heirich, 1991b). The two sites with follow-up and a menu of program interventions (Sites C and D) showed significantly better results than the sites without these components. At the end of 3 years, Sites C and D showed that up to 82% of people with hypertension had blood pressure readings below 160/95 and 47% had blood pressure readings below 140/90. Of the overweight employees, 51% maintained a weight loss of 3 pounds or more and 28% maintained a weight loss of 10 pounds or more. Twenty percent of the smokers were no longer smoking, 94% of the ex-smokers did not relapse into smoking, and 57% of all smokers and ex-smokers were nonsmokers at the end of the 3-year study period.

An analysis has been conducted of the cost-effectiveness of programs for high blood pressure, obesity, and cigarette smoking (Erfurt, Foote, & Heirich, 1991a). This article has a similar methodology to the present paper, and showed that where hypertension, obesity and cigarette smoking are the health risks being addressed, the provision of health education classes without outreach, counseling, and a menu of interventions is much less cost-effective at reducing these risks than programs that offer these services.

A limitation of the analysis in Erfurt, et al. (1991a) was that costs associated with operating physical fitness services were not included, nor were changes in physical exercise as an outcome measure. Using a similar methodology to Erfurt, et al. (1991a), the present analysis will include lack of exercise as a health risk, and the data analyzed will include the costs of establishing and operating physical fitness/exercise programs, along with the costs of interventions for blood pressure, obesity, and smoking. More specifically, this paper will report the costs of operating each of the four program models described above, and will examine these costs in relation to effectiveness at reducing the targeted health risks and preventing relapse. This analysis addresses the following hypotheses:

Hypothesis 1. Worksites with wellness programs that include routine one-to-one outreach and follow-up counseling (Sites C and D) will show fewer health risks after 3 years than programs without this component (Sites A and B), when health risks are defined as uncontrolled high blood pressure, cigarette smoking, obesity, and lack of exercise.

Hypothesis 2. The average cost per risk reduced and relapse prevented will be lower for programs providing regular one-to-one outreach and counseling than for programs organized around a fitness facility without such outreach and counseling.

METHODS

MEASURING PROGRAM COSTS

Six types of program costs will be included in the analysis:

1. The effort of the health educator hired for the study. Costs are based on actual hours worked over the 3-year study period (estimated at $20/hour). The health educator developed media materials for Sites A, C, and D, but devoted more time to Site A (the health education site).

2. The effort of the wellness counselors at Sites C and D, and of medical department staff operating the blood pressure monitoring program at Sites A and B (again based on actual hours worked, estimated at $20/hour). This includes the cost of monitoring risk levels in the at-risk population for each program model that included such monitoring.

3. The company-paid costs for health-improvement programs (classes, mini-groups, and one-to-one consultations with professional instructors).

4. For Sites C and D, the cost of initial screening to identify employees with the targeted risks. Screening was also conducted at Sites A and B, because this was necessary for research purposes. However, the models tested at Sites A and B did not require screening. Therefore, the costs of screening at Sites A and B are not included in estimating the cost of these program models. Initial screening costs are estimated at $25 per employee, which included the costs of planning and supervising screening, and screener training. Because screening should not be needed more often than once every 5 years, the annual cost of screening is estimated at $5 per employee. This does not include the cost of released time for participants, because screening was done on employees' own time.

5. For Sites B and D, the costs of buying and installing the equipment and supplies for the physical fitness facilities that were established at the site. At Site B this was a large room which housed a wide variety of weight and aerobic equipment. Site D had a smaller room with two bicycles, two rowing machines, and a basketball hoop. Costs at Site D also included marking out a walking course that ran throughout the plant. Costs do not include the use of the space in which the equipment was installed.

6. For Site B, the cost of the attendants who introduced employees to the equipment and monitored their use. Site D had no such cost, because the wellness counselors (whose costs are included in (2) above) handled these tasks.

The following costs were not included in the analysis:

1. The costs associated with conducting the research are not included. Thus, costs of screening Sites A and B, and of rescreening at all sites, are not included, because these activities were conducted for purposes of the research. They were not part of the program models being tested. Similarly, costs associated with development of the intervention strategies are not included.

2. No separate estimate has been made of the costs of employee benefits for the health educator, wellness counselors, and medical department staff who implemented the program models. A rate of $20/hour has been used to estimate the effort of these people, and this included both salary and benefits for the staff employed by the study. Hours taken as vacations, sick leave, paid holidays, and paid personal leave have not been included in the number of hours reported. The analysis shows only hours actually worked at the tasks of the project, but the wage rate attached to those hours includes benefits. Organizations are invited to use cost estimates based on their own salary structures, and recompute the analysis with the data provided.

3. Costs associated with operating a wellness committee at each location have not been estimated, for two reasons. These committees each met about once a month for policy, planning and oversight purposes, and costs were the same across all models tested. Thus, the addition of these costs would not affect the difference in costs among the sites. Second, these are generally indirect costs; while wellness committee members must find a way to be free for meetings and occasional other duties, this does not generally require expenditure of additional funds.

4. Administrative and overhead costs associated with operating program have not been estimated. These include costs of supervision, office space, telephones, office supplies, and so on. The models tested are labor-intensive and do not require substantial equipment or materials (other than those required for classes, fitness activities, and other interventions, which are included in the costs for those interventions). Costs of supervision will be similar across any model tested; every program must be supervised. Costs of office supplies are minimal. The cost of these supplies was less than $1 per employee per year during the study. Overhead costs can be more accurately estimated by individual companies, who are invited to add such costs into the cost calculations shown below.

5. The costs paid out-of-pocket by participating employees have not been estimated. The analysis is focused on costs to the sponsoring company or organization.

It may be noted that there were no costs associated with released time from work that would require replacement labor. Employees participated on their own time. Programs that involve substantial participation on released time are much more costly.

The costs of operating each of the four program models were annualized, and divided by the average number of employees at each site over the study period, to estimate the average annual cost per employee of operating each model. While not all employees participate in wellness programs, the rate of participation is different across different program models. The only fair way to allocate costs and to assess effects is across the entire target population.

Site A is designated as the comparison site, representing an inexpensive type of wellness program found in over 65% of all American worksites with more than 50 employees (Fielding & Piserchia, 1989). The costs associated with the additional activities offered at Sites B, C, and D are defined as the annual costs per employee at each of those sites, minus the annual costs per employee at Site A.

MEASURING PROGRAM EFFECTIVENESS AND COST EFFECTIVENESS

Program effectiveness is measured as the reduction in targeted risks and prevention of relapse, based on rescreening data. This reduction can be measured separately for each type of risk, but the costs of operating the programs cannot be assigned to specific risks. The program staff used a multiple risk reduction approach, and only a small portion of their time can be accurately apportioned to one risk or another. It is also not possible to allocate program costs based on the proportion of employees who had each risk, because many employees had more than one risk (e.g., both overweight and hypertensive).

Rather than attempt to apportion program costs to specific risks, this analysis will sum the risks together, giving the same weight to each identified risk. The risks identified at the initial screening that make up the sample for this analysis are the following:

1. High blood pressure.

2. Diagnosed hypertensive with blood pressure under control.

3. Overweight by 20% or more.

4. Smoked cigarettes.

5. Reported being a ex-smoker.

6. Needing regular exercise.

Categories 2 and were included as risks because ex-smokers and controlled hypertensives are at risk of relapse. Similarly, category 6 includes people who exercised regularly at screening (defined as exercising three or more times a week for at least 20 minutes with enough intensity to work up a sweat), for whom relapse to less exercise is a risk. Getting people to begin blood pressure treatment, to start exercising, and even to stop smoking, is not very difficult. Keeping hypertensives under treatment, keeping people exercising regularly, and keeping former smokers not smoking, is more difficult. Maintaining health improvements and preventing relapse is the heart of an effective wellness program. For these risks, effectiveness is measured as prevention of relapse.

For blood pressure and weight, two levels of risk reduction will be examined: high level (blood pressure maintained below 140/90 mm Hg, or sustained weight loss of 10 pounds or more), and moderate level (blood pressure maintained below 160/95, or sustained weight loss of 3 pounds or more). For smokers and ex-smokers, risk-reduction/relapse prevention is measured as not smoking at rescreening. For all employees, risk reduction/relapse prevention in the area of physical exercise is measured as reporting regular exercise at rescreening (exercising three or more times a week for at least 20 minutes with enough intensity to work up a sweat).

Site A (health education only) will be used to estimate the level of effectiveness to be expected when there are no special physical fitness services, no follow-up counseling, and no menu of health improvement programs. Most large worksites are now offering the types of services tested at Site A. Effectiveness of the wellness models at the three other sites will be computed by subtracting the level of effectiveness found at Site A from that at each of the other three sites, to estimate the additional effectiveness achieved at each site as a result of offering the added program components. Each measure of effectiveness will be evaluated in relation to direct program costs, to estimate (a) how much effect was produced by each dollar spent annually per employee, and (b) how much each unit of effectiveness cost for each employee annually.

RESULTS

Table 2 details the costs of the wellness programs that were implemented at the four study sites during the intervention period (1985-1988). (Table 2 omitted) Annual direct costs over the 3 years for these services ranged from $28,892 to $156,850. The average number of employees in the workforce over the study period is also shown, and average costs per employee are obtained by dividing the average annual cost by the average number of employees. The average annual cost per employee ranged from $17.68 at Site A to $39.28 at Site B.

The differences in program costs across the four sites reflect the type and quantity of services offered at each site. Site A had the lowest overall costs, even though it had the highest costs for health educator services and for health improvement programs. This program design focusing on health education is the least expensive model of the four

tested, and for this reason it is the comparison site in this analysis. Costs of follow-up counseling (comprised of blood pressure monitoring through the medical department) were low, and there were no costs for fitness facilities or services.

Site B had the highest overall costs, even though it had no costs for health educator services, the lowest costs for follow-up counseling (again comprised of blood pressure monitoring in the plant medical department), and the second lowest costs for health improvement programs. Over 90% of the costs at Site B were attributed to the physical fitness equipment, supplies, and attendants for the fitness center.

Sites C and D had the highest costs for follow-up counseling; both sites used on-site wellness counselors to carry out regular outreach and counseling with employees at risk of cardiovascular disease. At Site D the costs of providing physical fitness services in conjunction with the modest physical fitness center were included in the follow-up counseling costs, as were the costs of carrying out other activities associated with organizing the worksite for health promotion. Note that the amount spent on physical fitness equipment and supplies at Site D was less than 2% of the amount spent at Site B.

The bottom line of Table 2 shows the incremental annual cost per employee of the services added at Sites B, C, and D. These figures were computed by subtracting the cost of program operations at Site A (the site with health education only) from the costs at each of the other sites. At Site B, the incremental cost per employee per year for adding and staffing a physical fitness center was $21.60. For Site C, the incremental cost per employee for adding health education on a menu basis and follow-up counseling was $13.28. And for Site D, the incremental cost for adding health education on a menu basis, follow-up counseling, and plant organization was $20.89.

Table 3 shows the percent of the identified health risks that were reduced or relapse prevented, for each of the four study sites. (Table 3 omitted) The first row of the table reports the number of employees at each site who had one or more of the four targeted risk factors. The second row shows the total number of risk factors found among these employees. Each employee in the sample averaged 2.2 risk factors. The unit of analysis in this table is not the employee, but the risk factor. An employee with two health risks may have succeeded in reducing one risk, but not the other.

The reduction in risks ranged from 32% at Site B to 45% at Site D, for high level reduction or relapse prevention, and from 36% to 51% for moderate reduction. The differences across sites were statistically significant for both measures, based on analysis of variance. Pair-wise tests showed that each of Sites A and B were significantly different from each of Sites C and D, but Sites A and B were not different from each other, nor were Sites C and D.

These risk reduction figures are used in Table 4 to compute the incremental cost-effectiveness of the models tested at Sites B, C, and D, as compared with Site A. (Table 4 omitted) Section 1 of Table 4 repeats the percentages of risk factors that were reduced or relapse prevented, for each level of reduction/prevention. Section 2 shows the incremental percentage of risks reduced/relapse prevented at Sites B, C, and D, beyond those reduced or prevented at Site A. At Site B, the addition of a physical fitness center with attendants produced a decrement (-3%) of risks reduced or relapse prevented, as compared with Site A, despite the establishment of the fitness center. Both Sites C and D produced increments beyond that achieved at Site A, with Site C yielding an additional 9% of risks reduced/relapse prevented, and Site D an additional 10-12%.

Section 3 of Table 4 reports the incremental effectiveness of the program at each experimental site in reducing risks/preventing relapse, per dollar spent per employee annually on the wellness program. The figures are computed by dividing the increment in percent of risks reduced/prevented by the increment in annual cost per employee at Sites B, C, and D. Again for Site B there was a decremental percentage of risks reduced/relapse prevented, indicating that the greater amount of money spent on the fitness facility provided at Site B produced less risk reduction than the comparison program. For Sites C and D, the incremental amount of risk reduction/prevention per dollar spent was approximately half a percent per dollar spent.

Section 4 of Table 4 shows the additional cost per employee per year (beyond the costs at the comparison site) for producing an additional reduction in 1% of risks. For high level risk reduction, the wellness programs implemented at Sites C and D showed incremental cost of $1.48 and $2.09 spent per employee per year to reduce each additional percentage of risks and prevent relapse. For the moderate level of reduction, the comparable figures are $1.48 and $1.74 for Sites C and D.

Table 4 examines the incremental effectiveness and cost-effectiveness of the program models at Sites B, C, and D

against results to be expected with health education only (Site A). Only two of the sites (Sites C and D) showed incremental effectiveness beyond the comparison site. Table 5 examines these two sites in terms of their overall (rather than incremental) costs and effectiveness, using the moderate level of risk reduction. (Table 5 omitted) The percent of effectiveness at reducing risks/preventing relapse was about 1.3% to 1.5% per dollar spent per employee per year, and the total cost for each percent of risks reduced or relapse prevented was less than one dollar per employee per year ($.66 and $.76, at Sites C and D, respectively).

DISCUSSION

The data reported above on the percentage of risks reduced/relapse prevented among employees who are hypertensive, smokers, ex-smokers, overweight, or needing regular exercise, show that the physical fitness facility model tested at Site B did not produce any better results than the comparison model (health education only) after a 3-year test period. Previous analyses that examined changes in each of the four risk factors separately found no improvement among hypertensive employees at either Site A or Site B in level of blood pressure control, and no weight loss among the overweight employees at either of those sites. Previous analyses also found a higher rate of relapse among smokers trying to quit at Sites A and B, as compared with Sites C and D, very low levels of participation in worksite weight-loss ad smoking-cessation programs at Sites A and B, and a lower frequency of exercise at Sites A and B (Erfurt, et al., 1991b; Erfurt, et al., 1990; Heirich, et al., 1991). Because results at Site B were actually worse than those at the comparison site, the Site B intervention was by far the least cost-effective of the three models being compared, in terms of its impact on targeted risks.

It is ironic that may of the wellness programs in corporate America today are primarily fitness programs, and rely on the existence of well-equipped and staffed physical fitness facilities to promote healthy behaviors within the workforce. This limited wellness model is quite popular for two basic reasons: (a) the employees perceive the fitness facility as a valuable benefit, even though only a small percentage of employees may actually use the facility on a regular basis, ad may of these people might use some other facility if one were not available at work; and (b) the model is easy to implement (though expensive).

Like the health education model (Site A), the model employed at Site B is a passive type of wellness model, in which services are made available, but there is no effective outreach mechanism to draw the majority of employees to the facility and to keep them coming back. Attendants may sit in the fitness center like the "Maytag repairman," waiting for people to come. Because evaluation procedures often rely on reports of numbers of users (or even number of times the facility is used, without distinguishing the actual numbers of people using it), this model often provides no feedback concerning the degree to which risks are being reduced. In this respect the model is very like the health education model (Site A), which also does not normally collect outcome data on risks reduced or relapse prevented, so that companies adopting the model cannot tell whether or not the program is effective.

Despite the lack of evidence of effectiveness for this model, it is widely utilized and is high on the "wish list" of many companies that do not have such a fitness center. Data from this study indicate that a fitness facility that does not include systematic, persistent outreach to employees with health risks and routine long-term follow-up to assist them in making health improvements is not effective in reducing health risks.

The wellness design tested at Site D included plant organization as well as regular outreach and follow-up counseling. This model lends itself to the inclusion of a formal physical fitness program with a wide variety of different exercise and fitness modalities that can be tailored to different employees, including the older and less energetic ones. Site D had the highest overall rate of employee participation in physical fitness activities, and at the end of the study, the highest percentage of the total workforce exercising three or more times a week.

Sites C and D, in addition to producing higher levels of participation in exercise programs, also produced higher levels of participation in blood pressure treatment (for hypertensive employees) and in worksite smoking cessation and weight loss programs (for smokers and the overweight, respectively). Of all the risk factors reported in Table 3, only 12-18% of employees with each risk factor at Sites A and B took part in a risk reduction program for that risk factor, compared with 35-50% at Sites C and D. If we examine the cost figures from Table 2 in relation to these program participation data, the incremental cost was $3.60 per added percent participation at Site B (beyond that achieved at Site A). This compares with only $.36 and $.42 for each additional percent participation at Sites C and D, respectively.

We conclude that these cost-effectiveness analyses justify the addition to wellness program designs of regular outreach, follow-up counseling, and a menu of health improvement programs, but do not justify the addition of

fitness facilities without outreach and follow-up counseling. Results for the sites with follow-up components were substantially better than for the site with a fitness facility but no outreach or follow-up. This conclusion supports the initial hypothesis that behavior change requires sustained support, encouragement, and assistance with problem-solving, along with a variety of options for making changes.

When we examined overall cost-effectiveness figures for Sites C and D (as opposed to incremental cost-effectiveness produced by comparison with Site A), we found that it costs less than one dollar per employee per year to engage each additional 1% of the at-risk population into treatment for high blood pressure or into on-site programs for weight loss and/or smoking cessation, and to reduce risk or prevent relapse in each additional 1% of the health risks among employees who had high blood pressure, were overweight, smoked or had previously smoked cigarettes, or needed regular exercise.

Results for the Site C model and the Site D model were very similar. We believe one cannot choose between these two models on the basis of these cost figures alone. Site D had a shrinking plant population base during the course of the intervention period. This site achieved a somewhat higher success rate in risk reduction than Site C, but whether this came about because of the plant organization component that was added in this program design, or the greater opportunity to work intensively with individual employees as the size of the plant population shrank, is not clear from these data, and the differences were not statistically significant. Its greater success at reducing relapse into health risk behaviors leads us to prefer the Site D model, since the costs of implementation are not much higher than those at Site C. Some additional staff time is necessary to develop plant organization strategies, but these strategies can attract large numbers of participants who develop their own supports for health improvement, and move the "corporate culture" toward support for healthy lifestyles.

Based on the components examined in the present study, program models that are cost-effective include the following components: (a) wellness screening, (b)follow-up outreach and counseling, and (c) a menu of health improvement programs. Plant organization appears to improve the level of risk reduction achieved and to lower recidivism, but does not make as significant an impact, per dollar spent, as do the other components. These qualitative gains, however, and the relatively low additional costs per person that are required, lead us to recommend that plant organization be included as a program component. This set of components provides routine measurement of program participation and health outcomes, to allow continued measurement of program effectiveness and cost-effectiveness. More complete information on the procedures required to operate such a program may be found in a manual available from the National Heart, Lung and Blood Institute (Erfurt, Foote, Heirich, & Brock, in press).

LIMITATIONS OF THE STUDY DESIGN

This study design was limited in that each program model was tested in only one plant location, and one must be concerned about whether variables unique to a location may have affected the outcomes. This limitation is less serious than it might have been, because the program components hypothesized to produce the major effects (systematic one-to-one outreach and follow-up counseling) were provided at two sites (C and D) and not at the other two. Moreover, within each pair of plants (A and B vs. C and D), one plant was larger in size and the other smaller, and one was stable in population and the other changing. Finally, within each pair of plants, one had a traditional management structure, and the other was organized into work teams that were given more responsibility for work decisions than in the traditional plants. These differences in plant size, stability, and decision-making structure did not appear to affect the study results regarding the impact of outreach and follow-up counseling.

In using these data, the reader must be aware that there are basic costs of operating any wellness programs that have not been included in the comparisons made above. Some of these costs will vary widely from company to company--e.g., the cost of space. This analysis was intended to examine costs that differ significantly across program models, rather than all costs. Additional costs not included in Table 2 may be needed for organizations planning to implement a program. In particular, costs for salaries and benefits for wellness program staff (or alternatively, costs of contracting for these services), costs of overall supervision, and overhead costs if any, must be evaluated and recomputed as necessary. Moreover, in the present study one of the major modifiable health risks, high blood cholesterol, was not included. Because cholesterol is more costly to measure than are the other risk factors, this risk is more costly to address in screening and monitoring.

In addition, the costs reported in this paper reflect cost levels during the 1988 study period, and will need up-dating to reflect general cost increases over time. Our current estimate is that a comprehensive worksite wellness program, including all of the costs described in the previous paragraph along with direct program costs, will cost in the range of $70-$130 per employee per year, depending on local salary levels and overhead costs, on how

frequently follow-up is conducted, and on how much participation in screening ad health improvement programs is achieved.

It should also be clear that the data presented examine cost-effectiveness and not cost-benefit. The data do not tell us whether the costs of operating effective wellness programs will produce a subsequent cost-savings. Rather, they allow: to compare the amount of risk reduced/relapse prevented per dollar spent, across different models. Worksite wellness procedures should not be adopted unless they have been demonstrated to be effective in reducing the targeted health risks.

REFERENCES

Abrams AB, Follick MJ. (1983). Behavioral weight-loss intervention at the worksite: Feasibility and maintenance. Journal of Consulting & Clinical Psychology, 51, 226-233.

Alderman MH, Madhavan S, Davis, T (1983). Reduction of cardiovascular disease events by worksite hypertension treatment. Hypertension, 5(6) Supp V, V138-V143.

Bertera RL. (1990). The effects of workplace health promotion on absenteeism and employment costs in a large industrial population. American Journal of Public Health, 80, 11O1-1105.

Blair SN, Piserchia PV, Wilbur CS, Crowder JH. (1986). A public health intervention model for work-site health promotion. Journal of the American Medical Association, 255, 921-926.

Bly, JL, Jones RC, Richardson JE. (1986). Impact of worksite health promotion on health care costs and utilization. Journal of the American Medical Association, 256, 3235-3240.

Bowne DW, Russell ML, Morgan JL, Optenberg SA, Clarke AE. (1984). Reduced disability and health care costs in an industrial fitness program. Journal of Occupational Medicine, 26, 809-816.

Breslow L, Fielding J, Herrman A, Wilbur CS. (1990). Worksite health promotion: Its evolution and the Johnson & Johnson experience. Preventive Medicine, 19, 13-21.

Brownell KD, Cohen RY, Stunkard AJ, Felix MRJ, Cooley NB. (1984). Weight loss competitions at the work site: Impact on weight, morale and cost-effectiveness. American Journal of Public Health, 74, 1283-1285.

Cox M, Shephard RJ, Corey P. (1981). Influence of an employee fitness programme upon fitness, productivity and absenteeism. Ergonomics, 24, 795-806.

Erfurt JC, Foote A. (1984). Cost-effectiveness of work-site blood pressure control programs. Journal of Occupational Medicine, 26, 892-900.

Erfurt JC, Foote A, Heirich MA. (1989). Preventing CVD through worksite health promotion: 3 year findings from rescreening data. Ann Arbor, MI: University of Michigan Institute of Labor and Industrial Relations.

Erfurt JC, Foote A, Heirich MA. (1991a). The cost-effectiveness of worksite wellness programs for hypertension control, weight loss and smoking cessation. Journal of Occupational Medicine, 33, 962-970.

Erfurt JC, Foote A, Heirich MA. (1991b). Worksite wellness programs: Incremental comparison of screening and referral alone, health education, follow-up counseling, and plant organization. American Journal of Health Promotion, 5, 438-448.

Erfurt JC, Foote A, Heirich MA, Brock BM. (in press). Worksite wellness: A step-by-step manual for an effective program. Bethesda, MD: National Heart Lung and Blood Institute.

Erfurt JC, Foote A, Heirich MA, Gregg, W. (1990). Improving participation in worksite wellness programs: Comparing health education classes, a menu approach, and follow-up counseling. American Journal of Health

Promotion, 4, 270-278.

Erfurt JC, Holtyn K. (1991). Health promotion in small business: What works and what doesn't work. Journal of Occupational Medicine, 33, 66-73.

Fielding, JE. (1982). Effectiveness of employee health improvement programs. Journal of Occupational Medicine, 24, 907-916.

Fielding JE, Piserchia PV, (1989). Frequency of worksite health promotion activities. American Journal of Public Health, 79, 16-20.

Foote A, Erfurt JC. (1983). Hypertension control at the work site: Comparison of screening and referral alone, referral and follow-up, and on-site treatment. New England Journal of Medicine, 308, 809-813.

Foote A, Erfurt JC. (1991). The cost-benefit of worksite blood pressure control programs. Journal of the American Medical Association, 265, 1283-1286.

Gibbs JO, Mulvaney D, Henes C, Reed RW. (1985). Work-site health promotion: Five-year trend in employee health care costs. Journal of Occupational Medicine, 27, 826-830.

Gregg W, Foote A, Erfurt JC, Heirich MA. (1990). Worksite follow-up and engagement strategies for initiating health risk behavior changes. Health Education Quarterly, 17, 455-478.

Heirich MA, Cameron V, Erfurt JC, Foote A, Gregg W. (1989). Establishing communication networks for health promotion in industrial settings. American Journal of Health Promotion, 4, 108-117.

Heirich MA, Foote A, Erfurt JC, Konopka B. (1991). Worksite physical fitness programs: Comparing the impact of different program designs on cardiovascular risks. Ann Arbor, MI: University of Michigan Institute of Labor and Industrial Relations.

Heirich MA, Konopka B, Erfurt JC, Foote A. (1989). Encouraging physical fitness among older employees. Fitness in Business, 3, 175-180.

Hollander RB, Lengermann JJ. (1988). Corporate characteristics and worksite health promotion programs: Survey findings from Fortune 500 companies. Social Science and Medicine, 26, 491-501.

Jeffery RW, Forster JL, Snell MK. (1985). Promoting weight control at the worksite: A pilot program of self-motivation using payroll-based incentives. Preventive Medicine, 14, 187-194.

King AC, Taylor CB, Haskell WL, DeBusk RF. (1990). Identifying strategies for increasing employee physical activity levels: Findings from the Stanford/Lockheed exercise survey. Health Education Quarterly, 17, 269-285.

Klesges R, Vasey M, Glasgow R. (1986). A worksite smoking modification competition: Potential for public health impact. American Journal of Public Health, 76, 198-200.

Leviton LC. (1987). The yield from work site cardiovascular risk reduction. Journal of Occupational Medicine, 29, 931-936.

Logan AG, Milne BJ, Achber C, Campbell WP, Haynes RB. (1979). Work-site treatment of hypertension by specially trained nurses: A controlled trial. Lancet, 2, 1175-1178.

Pelletier KR. (1991). A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease prevention programs. American Journal of Health Promotion, 5, 311-315.

Spilman MA, Goetz A, Schultz J, Bellingham R, Johnson D. (1986). Effects of a corporate health promotion program. Journal of Occupational Medicine, 28, 285-289.

Stachnik T, Stoffelmayr B. (1983). Worksite smoking-cessation programs: A potential for national impact. American Journal of Public Health, 73, 1395-1396.

Stunkard AJ, Brownell KD. (1980). Work-site treatment for obesity. American Journal of Psychiatry, 137, 252-253.

Warner KE, Wickizer TM, Wolfe RA, Schildroth JE, Samuelson MH. (1988). Economic implications of workplace health promotion programs: Review of the literature. Journal of Occupational Medicine, 30, 106-112.

The work reported in this paper was supported jointly by grant #HL33099 from the National Heart, Lung, and Blood Institute, U.S. Department of Health and Human Services, and the General Motors United Auto Workers National Joint Committee on Health and Safety. We are indebted to General Motors Corporation, the United Automobile Workers, the UAW-GM Joint National Committee on Health and Safety, and in particular to Robert G. Wiencek, MD, MPH, former General Director of General Motors' Occupational Safety and Health Department and Ted Miller, former Assistant Director of the UAW's General Motors Department, for their assistance in carrying out this project. We especially wish to thank the wellness committees at each of the four UAW-General Motors plants in the study (made up of representatives from management, labor, and the medical department), who worked to insure that adequate coordination and resources were made available for the various program activities, and the members of the University of Michigan staff who carried out the various project tasks--Liliane Calati, RN, Victoria Cameron, Susan Czapski, RD, MEd, Cydne Friday, MA, Rebecca Goodman, BA, Walter Gregg, MPH, Barbara Konopka, PhD, Doris Newton, RN, Patricia A. Strauch, BS, Mary Uzdale, and the many nurses and paraprofessionals who assisted with the wellness screening.

Correspondence and requests for reprints should be directed to Andrea Foote, University of Michigan Institute of Labor and Industrial Relations, Victor Vaughan Building, 1111 East Catherine Street, Ann Arbor, MI 48109-2054.